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OBJECTIVES, PROGRESS OF NONFERROUS METALS CONSERVATION CAMPAIGN IN RUMANIA

PROBLEMS IN THE REPLACEMENT OF NONFERROUS METALS

A.M.S.

Rumania is suffering from a shortage of nonferrous metals because mining has lagged behind the demand, and because of increased agricultural and industrial consumption and the demands of the electrification program. To avoid imports, a campaign has been organized to conserve nonferrous metals. This has necessitated severe measures for economy in their use. Problems of the electrical industry in particular may be seen in the progress made by the Dinamo and Electroaparataj (Electrical Equipment) enterprises.

There is a tendency in many research bureaus studying the assembly of machines and installations to advise the use of the best materials possible. As a result, materials used are often of far too high a quality. Steel alloys are used where carbon steel would have been sufficient, bronze of high tin content where bronzes with zinc and 5 to 6 percent tin, or bronze with aluminum would be adequate. In some instances a composition of more than 80 percent tin has been used where 10 percent tin or bronze and lead would have given equal results. Such cases have occurred because planners desired to cover themselves for possible difficulties in machining, processing, and assembly of machines or aggregates. Faulty mixtures of steel and nickel have been used where neither material was required. At times, insufficient knowledge of materials utilized has been the cause of complications. The essential characteristics of a large percentage of the industrial raw materials have now been standardized.

In addition to the replacement of nonferrous metals by malleable iron, cast iron, and special irons and steels, the possibility of the replacement of nonferrous metals by nonmetallic products must be studied. Thus, for example, brick, porcelain, ceramics, wood treated wood, bakelite, and other plastic products are to be considered.

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Wherever it is impossible for ferrous metals to be used because of corrosive agents, it may be possible to cover the metal with a protective coating. In the past, surface coating was rarely used for the protection of the metal base, except for zincing of boilers, the galvanizing of sheet metal, pipes, and wires, the tinning of sheet metal, plating with nickel, chrome, and silver, and enameling of kitchen articles and toilet equipment. Metal plating in place of solid metal effects a substantial saving. But economies of short-term value only are not desired. Thus, one plant replaced zinc plates with zinc-coated plates. This reduced the use of zinc 80 percent, but reduced the life of the part from 8-10 years to approximately 2 years. The conservation of zinc was outweighed by the need for early repair, by cessation of work in the installation, and by the loss of the plates which had been zinc coated. The use of phosphates for the protection of steel wire can give satisfactory results in certain cases, but must not be adopted without serious consideration of characteristics required.

An example of the effective way in which the nonferrous metals campaign can be carried on is furnished by Sovrommetal (Soviet-Rumanian Metal Enterprise), where the work was divided into two stages. The first was the substitution of alloys with lower nonferrous content or the replacement of nonferrous metals in products where all factors are known. The second stage is the study of the replacement of finer parts, such as bearings.

RATIONAL UTILIZATION OF NONFERROUS METALS

Engr A. Sinescu

The nonferrous metals campaign is aimed principally at the conservation of aluminum, antimony, copper, tin, nickel, lead and zinc. Electrolytic copper, nickel, and zinc, pure tin, and smelted copper and antimony were designated as superior nonferrous metals by decree No 501 of the Council of Ministers.

Of these metals, copper and tin are in shortest supply. Copper is used principally in the electrical industry for third rails, and overhead lines. Copper cables can be replaced in large measure by aluminum or aluminum alloys. Standards are being established for aluminum-steel cables. Copper is being replaced in locomotive fireboxes by steel plates. Locomotive copper tubes were completely replaced by tubes of carbon steel. In other cases copper is used only as a component, e.g., steel plated with copper, steel tubes coated with brass, aluminum with copper plate. Tubes are made of an alloy of copper and silicon. Equipment or boilers for heating water by wood, gas, or electricity, formerly made of copper, can be made of a copper-silicon alloy or of copper-plated ferrous metals. Care must be taken in these processes, however, for too-thin copper plating has resulted in rapid deterioration and corrosion of the base. Aluminum plating for boilers was used with poor results, but zinc, enamel, or phosphate coatings have proved satisfactory.

The replacement of lead is of secondary importance since it is in more plentiful supply. Lead water pipes can be replaced by coated steel pipes. In the chemical industry lead can be replaced by ceramic products, aluminum, vulcanized rubber, synthetic rubber or other materials, and coated steel. In pumps, ceramics, quartz, and synthetic and other types of materials can be used.

Underground electric conduits can in some cases be made without a protective lead covering. Seals can be of aluminum. Aluminum foil, asbestos cement, sulfur, or rubber can be used for cable coverings, according to the type of construction involved.

Two methods have been used for the conservation of zinc: more efficient plating and the replacement of zinc by tile, brick, and other materials in construction.

Turbine blades of Monel metal can be replaced by blades of steel alloys with 14 percent chrome. Nickel alloys capable of resisting high temperatures are very difficult to replace. Attempts were made to reduce the temperature of the process involving the use of nickel alloy equipment to a maximum of 400 degrees centigrade so that some steel alloy could be used.

Nickel alloys for rheostats can be replaced by other alloys which contain no nickel.

IMPORTANCE OF THE NONFERROUS METALS PROBLEM
AND METHODS TO FOLLOW IN CONSERVATION (EDITORIAL)

Nonferrous metals, especially copper and its alloys, form an important resource for all branches of industry in the Rumanian People's Republic. Industrialization and especially electrification of the country depend in great measure on the supply of these metals. However, the country's mining and processing industries are not capable of keeping up with the rising demand.

The Electroaparataj (Electrical Equipment) enterprise has carried out successful research in conservation methods. It and Dinamo enterprise have addressed a call to all enterprises throughout the country to economize in the use of nonferrous metals.

The method employed by the Electroaparataj enterprise was as follows:

1. The plant prepared a record of each product which requires a nonferrous raw material in its manufacture. This record contained a list of all parts or ingredients and pertinent data on design, position, name, number of pieces, quality, dimensions, and weight.

2. A commission examined each item to determine possible substitutes to replace nonferrous metals, or to combine nonferrous with other materials in order to effect savings and to improve quality.

As a result of these studies it has been possible to substitute raw materials or eliminate them entirely from a manufacturing process. Economies realized within enterprises themselves show that these problems should not remain only within the scope of technical offices, but should be introduced into factories in the form of competitions.

The State Committee for Technical Problems can initiate competitions or authorize innovations. The Institute for Technical Literature of this committee gathered published material in preparation for the campaign. The State Standardization Commission has undertaken four types of measures as preparation. They are as follows:

1. Listing of products now made of nonferrous metals for which substitutes can be found.

2. Determination of conditions under which the reduction or replacement of materials can take place.

3. Introduction of new methods for the conservation of nonferrous metals.

4. The preparation of state standards (STAS) for materials which will serve to replace nonferrous metals.

Specific problems which have been studied are: irons and steels for anti-friction use, plastics such as textolite, lingoston, lingofon, and others, as well as wood to replace nonferrous metals. New specifications will be drawn up for these substitutes. New procedures must be developed in the use of protective surface coatings to replace nickel, chrome, and brass.

Enterprises and committees are advised to study only those innovations which will have practical use. All technicians and engineers must carry out this patriotic mission to conserve nonferrous metals.

SOVROMTRACTOR EXPERIENCE IN THE CONSERVATION OF NONFERROUS METALS

N. Vacareanu
Assistant Director-General,
Sovromtractor

Sovromtractor (Soviet-Rumanian Tractor Enterprise) has undertaken to study the problem of the replacement of nonferrous metals by substitutes. This study has included an analysis of possible substitutes, an investigation of the cost and time involved in their production, study of their availability in sufficient quantity to satisfy the demand, and research to determine whether this production would not require too great a utilization of equipment and whether difficulties would not arise through the change. Cases have occurred in which procedures were prescribed for the substitution of other substances for nonferrous metals, but unforeseen difficulties forced a return to the old method. This involved the re-establishment of previous processes with inevitable complications and loss of time. An example of this was the casting of transmission shift forks for tractors. These forks had to be discontinued, however, and bronze forks readopted because the technical bureau had devoted too little attention to the problem. This is not the only case. In fact, of 86 items proposed by the technical bureau of Sovromtractor for the elimination of nonferrous metals, only 29 were accepted. This is evidence of the failure of the Sovromtractor research bureau.

Other poor substitutions may be pointed out. For example, the fuel line of the diesel motor was changed to iron without analysis of possible complications, such as the rigidity of ferrous metals. Thus, the installation and mounting of the fuel line required eight times as much effort as its manufacture. Some parts require an entirely different technological procedure and therefore necessitate investigation to determine whether the substitute will give the desired effect. This was the case with radiator tubes, which, when changed from brass to iron, doubled production time, for additional heat processing was necessary. The greater hardness of the new material created new problems in assembly. These research efforts by the ASIT (Society of Engineers and Technicians) branch in the Sovromtractor plant can serve as an example for other ASIT branches throughout the country.

Workers of Sovromtractor pledged the conservation of 2,000 kilograms of nonferrous metal in honor of 7 November 1951.

Today, when the conservation of nonferrous materials has become a necessity, resistance has arisen among workers to a campaign for economy in their use. But this resistance is a result of inertia and laziness rather than of intentional hostility. Work must be organized on a more scientific basis and innovations tested by experiment before they are put into industrial use.

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REPLACEMENT OF COPPER IN THE ELECTRICAL INDUSTRY

Engineers M. Eustatziu and M. Popa

In the electrical industry the most important conducting materials are copper and its alloys, bronze, and brass. Copper is used on a large scale for electric power lines, telecommunications lines, electrical machinery, and transformers. To date, these items have been involved to only a small degree in the campaign for the conservation of nonferrous metals. The material usually considered for the replacement of nonferrous metals is aluminum, of which there are important deposits in Rumania. Exploitation of these sources could make large amounts of aluminum available to the electrical industry within a short time.

The manufacture of electric power lines consumes 80 percent of all copper used in Rumania. Thorough investigation has shown that for all practical purposes the use of copper can be reduced very little in the electrical industry. Overhead lines of copper and bronze will continue to be used for the distribution of low-tension currents of less than one kilovolt. In some networks lower-cost aluminum wire and steel-aluminum wire might be used. In other sectors, such as electrical machinery, the possibility of replacing copper without serious technical and economic disadvantages is limited. Technicians and engineers of the electrical industry are completely occupied at present with the electrification of the country and so are unable to give wholehearted attention to the problem.

REPLACEMENT OF NONFERROUS METALS BY PLASTICS

Prof Engr M. Popescu

The Rumanian People's Republic possesses all the necessary resources for the production of plastics which might be used to replace nonferrous metals. Products derived from the processing of steel, petroleum, cellulose products, casein, albumin, and the distillation of oils could provide raw materials for phenoplasts, vinyls, polystyrenes, polyethyls, acryl plastics, urea-melamines, cellulose products, and others.

It has been found that special textolite can be substituted for bronze or brass for cables. Textolite may also be used for insulation, and in place of alloys in the manufacture of tubes for chemical purposes. A new plastic material, of super-polyamide type, has been developed. This substance has shown exceptional resistance to all corrsive agents, and does not react to solvents, alkalies, oxidizing agents, and other chemicals. It has excellent mechanical and dielectric qualities. Thus, this plastic can replace nonferrous metals in the manufacture of containers for alcohol, wine, beer, milk, solvents, potashes, and oxidizing agents. It has been used successfully in the petroleum industry as a coating for steel pipes.

Nonferrous metals have been replaced by plastics in many cases. Getinax, deltamin, and textolite have been used in constructions where material of great mechanical strength was required. Asbolite and atorproc have been used as friction materials. Graphitized textolite has been used for antifriction. Getinax A and B, textolite, and balnite serve as electrical insulation. Etiloid has proved superior to plexiglass. Vermiculite has been used for boiler and radio insulation.

In addition, part of the medical equipment manufactured from nickel, chrome, chrome-nickel, and other materials could be made of plastics.

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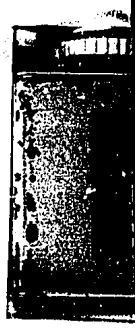

MANUFACTURE OF WOODEN DOOR HANDLES

Engineers N. Valeanu and Dr Gh. Retea

A collective formed by the technicians and engineers of the State Standardization Commission and the Magura Codlei Factory is carrying out research in the conservation of nonferrous metals. It has determined that a large quantity of nonferrous metals has been used for the manufacture of door handles.

Tests showed that wood fulfilled all requirements and could furnish raw material for all necessary parts. The Magura Codlei Factory developed a wooden door handle that cost 70 lei less than a comparable one of aluminum. This enterprise alone will be able to produce approximately 200,000 wooden door handles in the first year of production, with a saving of approximately 170,000 kilograms of nonferrous metals.

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